A. OLIVER.

QUARTZ-MILL.

No. 187,664. Patented Feb. 20, 1877.

Fig. 1.

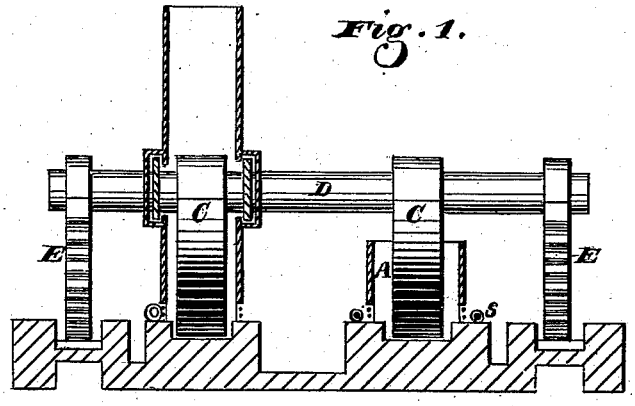
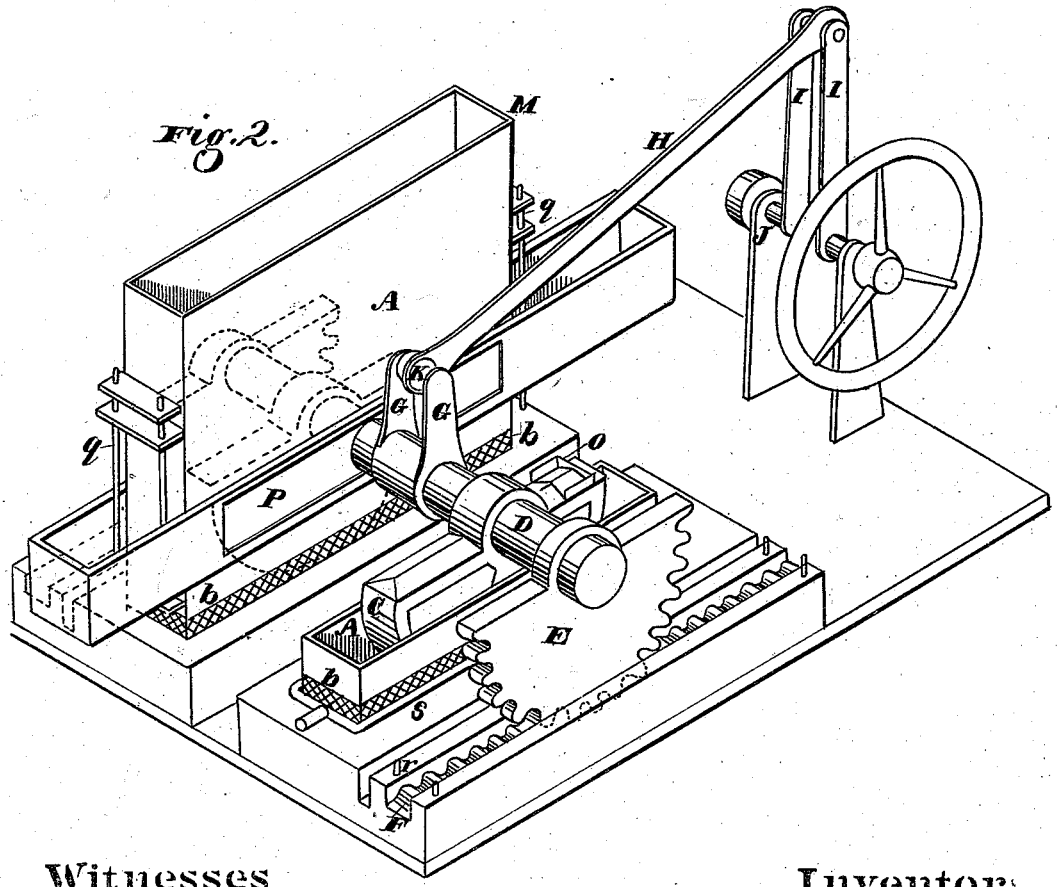



Fig. 2.

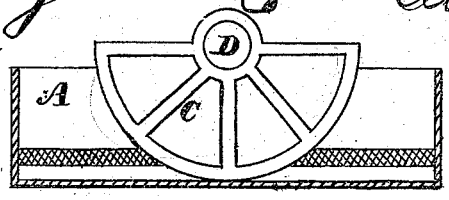



Witnesses

Geo. H. Strong

Jno. L. Boone

Fig. 3.




Inventor

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# UNITED STATES PATENT OFFICE.

ALLEN OLIVER, OF FOREST HILL, CALIFORNIA.

## IMPROVEMENT IN QUARTZ-MILLS.

Specification forming part of Letters Patent No. **187,364**, dated February 20, 1877; application filed September 4, 1876.

*To all whom it may concern:*

Be it known that I, ALLEN OLIVER, of Forest Hill, in the county of Placer and State of California, have invented an Improved Quartz-Mill; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings.

The object of my invention is to provide a machine for crushing quartz and other hard substances by means of rolling weights.

These rolling weights I apply and operate so as to avoid the objections to the Chili mill or whirl system, in which connection the rolling-weight principle has heretofore been usually attempted. These attempts, however, have so far failed to produce a crushing-mill that will operate successfully and economically, principally because of the mechanical difficulties encountered in handling the immensely heavy wheels required to do the work.

In my machine I operate the rolling weights by a direct or reciprocating motion, so that I obtain the benefit of direct action and reaction in the working effects of the weights upon the ore in the battery, and am also able to operate the weights by a direct or rectilinear motion, all as hereinafter more fully described.

In constructing my crushing-mill I first build a strong bed or frame-work of timber, upon which I construct the batteries A A. These batteries I place at a short distance apart and parallel with each other, and each one will consist of a long box, as represented. The lower part of the sides and ends of the batteries will be constructed of screens *b b*, in the usual way, through which the crushed and pulverized ore or pulp will pass after it has been properly reduced in the batteries. C C are my rolling weights or crushers, each of which may be a wheel of the required size and weight, or, preferably, a segment or semi-wheel, as represented. Each wheel or segment is made of the proper width to fit in one of the batteries, so that its rim or circular face will rest upon the bottom of the battery. The circular face of each wheel I provide with suitable shoes, and the bottom of the batteries I provide with suitable dies, so that they can be removed and new ones replaced as they wear out.

These provisions, however, will suggest themselves to the practical mill-man, as they are familiar devices in the construction and operation of all crushing-mills. The chief novelty in my improved quartz-crusher, however, consists in imparting to these wheels or circular faced weights a rocking or reciprocatory rolling motion inside of the batteries, so as to obtain the advantage, first, of operating them by a direct application of power; secondly, of increased speed; and, thirdly, of subjecting the ore to the action and reaction of the weights, by which I secure greater crushing capacity.

The weights C C I connect together by a shaft, D, which passes across above the batteries, and connects the central point of the weights about which the curved crushing faces or rims are described. This shaft is permanently secured to the weights, so that they all move together. The ends of the shaft project beyond the batteries on each side, and a toothed segment or wheel, E, is secured to each extremity. The rims of these segments describe the same curve or arc as the faces of the crushing-rockers, and the teeth on their rims engage with a horizontal rack, F, which is constructed below them, as represented. An arm, G, extends upward from the middle of the shaft D, between the two batteries, and a pitman, H, connects the extremity of this arm with a crank, I, of the driving-shaft J, so that the rotation of the driving-shaft imparts a rocking motion to the shaft D, crushing weights C C, and toothed segments E.

The toothed segments, by their engagement with the racks F, prevent the crushing-weights from shifting their position bodily, but allows them to accomplish a reciprocating semi-rotary motion inside of the batteries. This is necessary, as the centers of the crushing-weights, and, consequently, the shaft D, are continually changing their position, and some device is required to hold the weights to their proper position inside of the batteries. The pitman H is attached to the arm G of the shaft D by a ball-and-socket or other equivalent

oint, K, so that in case one of the weights should pass over an inequality, the machine will not be cramped, but the flexibility of the joint will permit the weights to rise and fall, as necessity requires.

The battery will usually be constructed high enough, as represented at M, to permit of an ore-feeder being placed over it, so as to feed the ore into the top of the battery or box, and allow it to fall upon the upper straight side of the crushing-rollers; and to accomplish the feeding properly, I construct the upper or straight side of the weights with a central ridge and sloping sides, so that the ore will be equally divided and fed upon each side. A scoop or raised flange, O, is constructed around the end and part of the sides of the ridged upper surface of the weights, so that the ore will be dropped at the center as the weights move back, and not be fed over the end of the top. I thus provide for automatically feeding the ore to the stamps in a practical manner.

To render the batteries air-tight, I arrange a slide, *p*, in both sides of each battery through which the shaft D passes, and this slide moves between the double walls of the battery, and serves to close the space which the shaft D requires to travel in. This slide moves with the shaft, and the joint between it and the sides is packed, so as to prevent the escape of dust or sand, while its lower edge moves in a trough of water to render the lower joint tight.

The box or battery M can be raised or lowered by means of screw-rods *q q*, and the racks F are also arranged to be adjusted in height by screw-rods *r*, so that as the faces of the crushing weights or rockers wear away, they can be lowered so as to preserve a uniform contact with the dies.

This machine can be used for crushing either by wet or dry process. When the wet process is used, I employ a water-pipe, S, which surrounds each battery, and is provided with a number of tubes leading through the sides and ends of the battery, and each tube is regulated by a cock. (Not shown.) The pipe S leads from some reservoir or source of supply, by which a hydraulic pressure is obtained, so that when the cocks are opened a number of small streams of water will be discharged under the pressure into the battery, so as to agitate the pulp while the crushing action is going on. When I crush by the dry process, I will use currents of air similarly distributed for the same purpose.

I thus provide a crushing-mill in which the ore is subjected to the pulverizing action of rolling weights, and at the same time the machinery is capable of yielding to the necessary unsteadiness and inequalities of action required in a machine for crushing hard substances. The weights act and react upon the ore, thus accomplishing better results than where the crushing action is only given in one direction. The streams of water or air loosen up the pulp and agitate it so as to present every particle to the action of the crushers, and also assist in discharging the pulp. The rolling action of the crushers also assists in forcing the pulp against the screens, so that I provide ample means for discharging the pulp as fast as it is reduced fine enough to pass through the screens. Dams can be built around the screens outside of the batteries, and grooves or channels *x* will lead the pulp into the vessels or receptacles intended for containing it.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A crushing-mill consisting of a series of curved-faced crushers located in a series of parallel batteries, and upon a shaft provided at each end with segmental pinions, said crushers having a reciprocating motion imparted by pitmen H and racks F, as set forth.

2. The crushing roller or weight C, provided with a circular lower face and a straight upper side, said upper side being ridged and provided with a curb or raised flange, O, in combination with the box M, substantially as and for the purpose described.

In witness whereof I have hereunto set my hand and seal.

ALLEN OLIVER. [L. S.]

Witnesses:

OLWYN T. STACY,

GEO. H. STRONG.